CLAIMS

1. An optical amplifier apparatus comprising:

a first front-end optical fiber amplifier that amplifies incident light;

a first front-end pumping light source that generates first pumping light supplied to said first front-end optical fiber amplifier;

a first front-end pumping light introducing means that introduces the first pumping light to said first front-end optical fiber amplifier;

a first back-end optical fiber amplifier that amplifies outgoing light of said first front-end optical fiber amplifier;

a second front-end optical fiber amplifier;

a second front-end pumping light source that generates second pumping light supplied to said second front-end optical fiber amplifier;

a second front-end pumping light introducing means that introduces the second pumping light to said second front-end optical fiber amplifier from an outgoing side which is opposite to an incident side;

a second back-end optical fiber amplifier that amplifies outgoing light of said second front-end optical fiber amplifier;

a back-end pumping light source that generates third pumping light supplied to said first back-end optical fiber amplifier;

a back-end pumping light introducing means that introduces the third pumping light to said first back-end optical fiber amplifier; and

an optical connecting means that (1) connects an outgoing side of said first back-end optical fiber amplifier and said back-end pumping light introducing means to each other, or (2) connects the outgoing side of said first back-end optical fiber amplifier and the incident side of said second front-end optical fiber amplifier to each other thereby causing the second front-end optical fiber amplifier to amplify outgoing light of said first back-end optical

fiber amplifier.

2. The optical amplifier apparatus according to claim 1, comprising a light blocking means that blocks light from said first back-end optical fiber amplifier to said first front-end optical fiber amplifier.

3. The optical amplifier apparatus according to claim 1, wherein said optical connecting means connects the outgoing side of said first back-end optical fiber amplifier and the incident side of said second front-end optical fiber amplifier to each other, and, simultaneously, the outgoing side of said second back-end optical fiber amplifier and said back-end pumping light introducing means to each other.

4. The optical amplifier apparatus according to claim 1, wherein if said optical connecting means connects the outgoing side of said first back-end optical fiber amplifier and said back-end pumping light introducing means to each other, a gain of said first front-end optical fiber amplifier is as large as a noise of said first back-end optical fiber amplifier can be neglected.

5. The optical amplifier apparatus according to claim 4, wherein if said optical connecting means connects the outgoing side of said first back-end optical fiber amplifier and the incident side of said second front-end optical fiber amplifier to each other, a combined gain of the gain of said first front-end optical fiber amplifier, a gain of said first back-end optical fiber amplifier, and a gain of said second front-end optical fiber amplifier is as large as a noise of outgoing light of said second back-end optical fiber amplifier is approximately maintained.

6. The optical amplifier apparatus according to claim 1, wherein if said optical connecting means connects the outgoing side of said first back-end optical fiber amplifier and said back-end pumping light introducing means to each other, a wavelength band of the outgoing light of said first back-end optical fiber amplifier is the C-band.

7. The optical amplifier apparatus according to claim 1, wherein if said optical connecting means connects the outgoing side of said first back-end optical fiber amplifier and the incident side of said second front-end optical fiber amplifier to each other, a wavelength band of the outgoing light of said second back-end optical fiber amplifier is the L-band.

8. The optical amplifier apparatus according to claim 1, wherein at least one of said first front-end optical fiber amplifier, said first back-end optical fiber amplifier, said second front-end optical fiber amplifier, and said second back-end optical fiber amplifier is an Erbium-doped optical fiber.

9. The optical amplifier apparatus according to claim 1, wherein wavelengths of the light generated by said first front-end pumping light source, said second front-end pumping light source, and said back-end pumping light source are 980 nm.

10. The optical amplifier apparatus according to claim 1, comprising:

a third front-end optical fiber amplifier that amplifies the outgoing light of said second front-end optical fiber amplifier, and emits amplified light to said second back-end optical fiber amplifier;

a third front-end pumping light source that generates fourth pumping light supplied to said third front-end optical fiber amplifier; and

a third front-end pumping light introducing means that introduces the fourth pumping light to said third front-end optical fiber amplifier from an outgoing side which is opposite to an incident side.

11. An optical amplifier apparatus comprising:

a first optical fiber amplifier that amplifies incident light;

a second optical fiber amplifier;

a back-end pumping light source that generates pumping light supplied to said first optical fiber amplifier;

a back-end pumping light introducing means that introduces the pumping light to said first optical fiber amplifier; and

an optical connecting means that (1) connects an outgoing side of said first optical fiber amplifier and said back-end pumping light introducing means to each other, or (2) connects the outgoing side of said first optical fiber amplifier and an incident side of said second optical fiber amplifier to each other thereby causing the second optical fiber amplifier to amplify the outgoing light of said first optical fiber amplifier.